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Research Note

Hematozoa of Spring- and Fall-Migrating Northern Saw-Whet Owls (*Aegolius acadicus*) in Wisconsin

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ABSTRACT: Seventy-two Wisconsin northern saw-whet owls (*Aegolius acadicus*) were sampled for hematozoans during spring and fall migrations in 1993–1994. Three species of parasites were found: *Leucocytozoon ziemanni* in 39 of 72, *Haemoproteus* sp. in 3 of 72, and an unidentified microfilaria in 8 of 72. Thirty birds harbored *L. ziemanni* only, 2 had microfilariae only, 6 had both *L. ziemanni* and microfilariae, and 3 had *L. ziemanni* and *Haemoproteus* sp. Relative age indicated that the birds ranged from <1 yr old to >3 yr old. All age groups were infected. Our sample size was too small to determine a trend; however, the fact that we found infected birds older than 3 yr suggests that infections may persist for more than 1 yr or that older owls are capable of being reinfected.

KEY WORDS: northern saw-whet owls (*Aegolius acadicus*), *Leucocytozoon ziemanni*, *Haemoproteus* sp., microfilariae, Wisconsin, fall and spring migrants.

No information is available on the hematozoa of migrating northern saw-whet owls (*Aegolius acadicus* Gmelin) through Wisconsin, and very little is known about this species in general. Bennett et al. (1989) recorded members of the genus *Leucocytozoon* and *Trypanosoma* in this owl in Canada, but we are aware of no other studies. Herein we present data obtained from 72 birds of relative age, captured during their spring and fall migrations in 1993–1994.

Saw-whet owls were trapped in mist nets at the Linwood Springs Research Station in central Wisconsin (44°28′N, 89°40′W) (during their nocturnal migration [18 October to 7 November 1993, 3–24 March, and 28 September to 23 October 1994]). Ages of all owls were determined by plumage characteristics (Evans and Rosenfield, 1987). Blood samples were taken, fixed in methanol, and stained in Giemsa as reported by Taft et al. (1996). Following Godfrey et al. (1987), blood cells from positive smears were counted in order to enumerate hematozoa. Statistical tests follow Zar (1984) and were conducted with SYSTAT (Wilkinson 1992). Significance was accepted at the 0.05 level.

Voucher specimens for *Leucocytozoon ziemanni*, *Haemoproteus* sp., and microfilariae from northern saw-whet owls were deposited in the University of Nebraska State Museum, Harold W. Manter Laboratory Collection (HWML Nos. 38736–38739), Lincoln, Nebraska 68588.

We found 3 species of hematozoans among 72 saw-whet owls aged from <1 yr to >3 yr: *Leucocytozoon ziemanni* were found in 39 of 72 birds, *Haemoproteus* sp. in 3 of 72, and microfilariae in 8 of 72. Thirty owls harbored *L. ziemanni* only, 2 microfilariae only, 6 both *L. ziemanni* and microfilariae, and 3 had both *L. ziemanni* and *Haemoproteus* sp. Measurements of 10 microfilariae averaged 151 × 5 μm. Infected birds older than 3 yr indicates that infections persist >1 yr or that older birds are reinfected.

We found no evidence of a seasonal prevalence or yearly difference of *L. ziemanni* in saw-whet owls. There was no significance between the number of *L. ziemanni* per 2,000 erythocytes in saw-whets captured during the autumns of 1993 and 1994 (Mann-Whitney *U*-test statistic = 132, $P = 0.11$, df = 1). We further did not find a significant difference between the number of *L. ziemanni* per 2,000 erythrocytes in owls trapped during the spring and fall of 1994 (Mann-Whitney *U*-test statistic = 117.5, $P = 0.20$, df = 1), nor did we find a significant difference between numbers of *L. ziemanni* per 2,000 erythrocytes in these owls caught during the fall of 1993 and spring of 1994 (Mann-Whitney *U*-test statistic = 67.5 $P = 0.25$, df = 1). Samples were too small for analyses of other potential interyear or interseasonal differences in

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Table 1. Mean number and range of *Leucozytozoon ziemanni* per 2,000 erythrocytes in migrating northern saw-whet owls in Wisconsin. Number in parentheses equals sample size.

Season and year	Age of owls			
	1 Yr	2 Yr	3 Yr	>3 Yr
Fall 1993	5.2 (5)	13.5 (6)	5 (2)	20 (1)
	0–17	0–34	3–7	—
Fall 1994	2.0 (4)	2.1 (9)		
	0–3	0–5		
Spring 1994		3.9 (7)	7.8 (4)	0 (1)
		0–11	5–12	—

parasites (*Haemoproteus* sp. and microfilarial prevalence in Table 1). Parasitemia was low, with the highest number parasites being 34/2,000 in 1 bird. Our data suggests that both spring and fall migrants exhibit chronic low level infections. Taft et al. (1994) surveyed hematozoans from Wisconsin Cooper's hawks (*Accipiter cooperii* Bonaparte) and observed prevalence rates for *L. toddi* and *Haemoproteus* sp. as high as 100 and 88%, respectively, but no other hematozoa were noted. Taft et al. (1996) examined blood from a total of 116 autumnal migrant hawks and 2 long-eared owls (*Asio otus* L.) from Duluth, Minnesota. Prevalence rates of *L. toddi* and *Haemoproteus* sp. ranged from 100 to 0% in 8 species of hawks, and 1 of 2 owls harbored *L. ziemanni*, reported as *L. toddi*. In 4 of 11 strigiform and falconiform species from Florida, Forrester et al. (1994) found *Haemoproteus* to be most common, followed by *Plasmodium*, *Leucocytozoon*, and 1 example of *Trypanosoma confusum* in *Strix varia* Barton and an unidentified microfilaria from *Tyto alba* Scopoli. They suggested that, compared to strigiforms, leucocytozoons are more common in falconiforms because of the diurnal behavior and higher perch used by hawks and falcons. Our data regarding *L. ziemanni*, *Haemoproteus*, and microfilariae seem to be the reverse of those of Forrester et al. (1994). We suppose that leucocytozoons (relative to *Haemoproteus* sp.) would be the most common parasites of strigiforms because owls tend to forage at night and roost during the day when blackfly vectors of leucocytozoons (Crosskey, 1990), are generally active. Ceratopogonids (*Culicoides*), the most likely vectors of *Haemoproteus* sp., are, however, active nocturnally (Kettle, 1977). Greiner et al. (1975) recorded few microfilariae from owls. Gutierrez (1989) surveyed 3 subspecies of spotted owls from 6 areas in California and found a range from 9 to 82% of microfilarial prevalence among sites. He suggested that the wide range could have been a function of survey technique, failure to account for parasite periodicity, or real differences in distribution and abundance. Compared to the work of Gutierrez (1989), our microfilariae prevalence was low; however, ours is high compared to other surveys on raptors. Prevalence could be related to the time of day the birds were sampled. Anderson (1992) reported that periodicity in 3 species of avian microfilariae occurred between 1600 and 2300 hrs in diurnally foraging birds. In our study, we sampled Saw-whets between 1930 and 2400 hours when microfilariae in the peripheral blood should be lowest due to the owl's activity. If periodicity is a factor, one would expect to find a higher prevalance of microfilariae in the peripheral blood of resting saw-whets during the day compared to the blood sampled at night.

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Research Notes

Some Parasites from Sumatran Elephants in Indonesia

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ABSTRACT: Three Sumatran elephants (*Elephas maximus sumatranus*) in Way Kambas National Park, Indonesia, that died of clostridiosis were infected with 1 species of nematode (*Murshida falcifera* (Cobbold, 1882)), 2 trematodes (*Hawkesius hawkesi* (Cobbold, 1875), *Pfenderius papillatus* (Cobbold, 1882)), and 1 larval botfly (*Cobboldia elephantis* (Steel, 1878)) species in the gastrointestinal tract. This is the first report of *Hawkesius hawkesi*, *P. papillatus*, and *C. elephantis* infection in Sumatran elephants in Indonesia.

KEY WORDS: Sumatran elephant (*Elephas maximus sumatranus*), Indonesia, nematode, trematode, botfly.

The Sumatran elephant (*Elephas maximus sumatranus*) is the smallest of the 4 subspecies of Asian elephants and is distributed only in the island of Sumatra. The genus *Elephas* is considered to have appeared in the Pliocene; however, it is not clear when the Sumatran elephant was isolated from other Asian elephants. At present, the Sumatran elephant is an endangered species, and their number is estimated to be between 2,800 and 4,800 (Santiapillai and Jackson, 1990).

The Way Kambas National Park is located in Lampung Province, on the southeast tip of Sumatra (4°37′S–5°16′S, 105°55′E). This national park has abundant wildlife species, including the Sumatran elephant, tiger (*Panthera tigris sumatrae*), and rhinoceros (*Dicerorhinus sumatrensis*). The elephant training center in the national park keeps more than 120 elephants, which were caught in various parts of Sumatra.

In a previous study, strongylid eggs were found in fecal samples from 40 (34%) of 118 elephants in this elephant training center (Hayani, 1994); however, other reports of parasites recovered from Sumatran elephants have not been published to date.

In February 1995, 17 elephants were transported to West Lampung Prefecture; 3 male elephants, ranging from 10 to 13 yr old, died suddenly of a clostridial infection. All animals were necropsied in the field and the gastrointestinal tract was removed from the abdominal cavity. Each part (stomach, small intestine, and large intestine) was opened and visible worms collected. No attempt was made to recover all parasite specimens.

One botfly species was collected from the stomach and fixed in 70% ethanol, the 1 species of nematode from the large intestine was fixed in glycerol–alcohol, and 2 trematode species from the large intestine were fixed in 10% formalin. Several trematode specimens were flattened between glass slides and placed in 70% ethanol for Schneider's acetocarmine staining.

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